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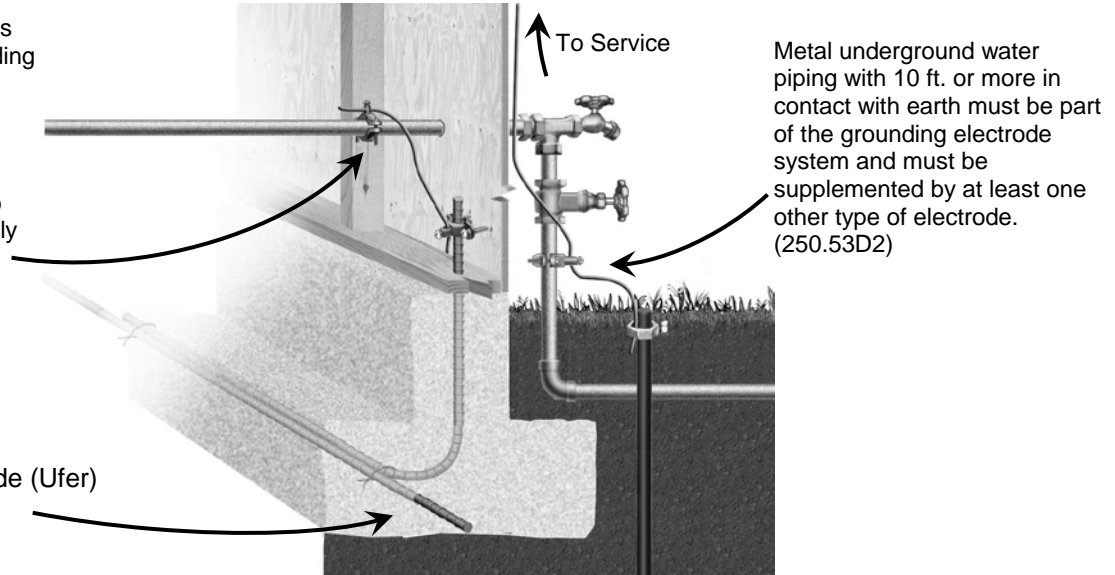
Automated Inspection Scheduling System: 408-615-2400

2016 CALIFORNIA ELECTRICAL CODE GROUNDING ELECTRODE SYSTEMS

Bond all available electrodes together to form the Grounding Electrode System (250.50)

Water piping can be used to bond different electrodes only within the first 5 ft. of water piping into the building. (250.68C1)

Concrete-encased electrode (Ufer) (250.52A3)



- A concrete-encased electrode (Ufer) is required when new footings are created in direct contact with soils. (250.50). It can be a minimum of 20 linear feet of #4 or larger rebar in the foundation footing, or a bare 4 AWG copper wire. Pieces of rebar can be spliced with the usual steel tie wires to obtain the required 20 feet. Rebar that is normally present as part of the footing design can be used as the Ufer. The connection to the Ufer must be accessible; a piece of rebar is typically a blank cover plate is often installed on a mud ring at the clamp location.
- Metal underground water piping with 10 ft. or more in contact with earth must also be used as part of the system (250.52A1). Clamps to copper water tubing must be listed for same. Bonding jumpers must be installed around unions, regulators, or filters on the incoming line (250.53D1). Metal water piping must always be supplemented with one or more other electrodes (250.53D2).
- Ground rods must be driven their full depth (250.53G), though when the grounding electrode conductor requires protection, a slight amount of the rod can stick out above the ground surface.
- All available electrodes must be bonded together (250.50). Connections to water piping must be made no further than 5 feet from the pipe's point of entry into the building (250.68C1).
- Bonding conductors and grounding electrode conductors are sized based upon the service conductor size. The minimum size is 8 AWG. Grounding electrode conductors ending at a Ufer never need be larger than 4 AWG (250.66B), and those ending at ground rods never need be larger than 6AWG (250.66A). Water pipe conductors are sized as follows:

<u>Copper Service Entrance Size</u>	<u>Aluminum Service Entrance Size</u>	<u>Grounding Electrode Conductor Size</u>
≤ 2	≤ 1/0	8
1 or 1/0	2/0 or 3/0	6
2/0 or 3/0	4/0 or 250 kcmil	4
4/0 – 350 kcmil	> 250 – 500 kcmil	2
> 350 – 600 kcmil	> 500– 900 kcmil	1/0

- 8 AWG grounding electrode conductors always require protection (250.64B). 6 AWG conductors do not require protection where closely following the building surface and not exposed to physical damage. 4 AWG conductors and larger require protection when exposed to physical damage.
- Protection for the grounding electrode conductor can be schedule 80 PVC conduit. If the protection is metal tubing, it must be bonded at each end. Bonding at the panel cannot be with ordinary locknuts (250.64G). Grounding type locknuts can be used when no concentric knockouts remain; bond bushings are required with remaining concentrics or reducing washers. Bonding at the electrode is with a clamp made for the purpose that connects either to the electrode or to the conductor.
- The conductor from the service equipment to the grounding electrode system must be installed in a single piece without splices (except splices made with irreversible connections or exothermic welding) (250.64C). Bonding conductors that connect the different parts of the grounding electrode system can be separate wires.